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creasing temperature down to 0.35 K. Since thermal-broadening effects are negligible in comparison to collision-broadening of the Landau levels at these temperatures,[1] our data are not consistent with models[1,2] that attribute the negative magnetoresistance to Landau levels in a quasi-two-dimensional band structure. Implications regarding the morphology of these fibers and its effects on their applications will be discussed.

*Supported by NASA, Grant # NCC-3-19.
+Supported by the NSF Low-Temperature Physics Program, Grant # DMR-8204173.

1 A. A. Bright, Phys. Rev. B20, 5142 (1979).
2 K. Yazawa, J. Phys. Soc. Japan 26, 1407 (1969).

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10:48

MP 10 X-Ray Determination of the Substrate Modulation Potential for a 2-D Rb Liquid in Graphite. S.C. MOSS, G. REITER, J.L. ROBERTSON, C. THOMPSON, University of Houston*; K. OHSHIMA, Nagoya University.--Using a recent theory[1] for the scattering of X-rays by 2-D liquids in a periodic host, we have determined the Fourier coefficients, V_{HK}, of the graphite modulation potential V(r), for a Rb liquid intercalated to stage 2 in graphite. Apart from the effects on the liquid scattering pattern, this induced potential produces contributions of Rb to the (HK.L) graphite Bragg peaks and these may be used to compute V_{HK} via a Monte Carlo (iterative) procedure. The dominant contribution turns out to arise from the first term, V_{10}, which is about -0.01eV.

* Research supported by NSF: DMR-82-14314

1. George Reiter and S.C. Moss (submitted to Phys. Rev.)

11:00

MP 11 **Magnetoresistivity and Monte Carlo Studies of Magnetic Phase Transitions in C_6Eu.**† S.T. CHEN, G. DRESSELHAUS, M.S. DRESSELHAUS; MIT, H. SUEMATSU, H. MINEMOTO, K. OHMATSU; Tsukuba Univ., AND Y. YOSIDA; Toyama Univ.–The high field magnetoresistivity $\rho(H)$ of the antiferromagnetic first stage graphite intercalation compound C_6Eu has been measured in steady magnetic fields up to 28 T with $\vec{H} \perp \hat{c}$ and $\vec{H} \parallel \hat{c}$. Both longitudinal ($\vec{J} \parallel \vec{H}$) magnetoresistivity $\rho_\ell(H_\perp)$ and transverse ($\vec{J} \perp \vec{H}$) magnetoresistivity $\rho_t(H_\perp)$ with $\vec{H} \perp \hat{c}$ show distinct changes across the magnetic phase boundaries which occur at fields of 1.5T, 8T, 15T and 21.5T at a temperature of 4.2 K. The phase transition at H=15T was not observed previously by the pulsed magnetization measurements. A Monte Carlo simulation based on the Hamiltonian of Sakakibara and Date was carried out for the C_6Eu system. The 15T phase transition is explained as a transition from a "canted" to a "fan" state. The transverse magnetoresistivity $\rho_t(H_\parallel)$ with $\vec{H} \parallel \hat{c}$ shows a clear anomaly at the field corresponding to the onset of the transition to the spin aligned paramagnetic state. A magnetic phase diagram has been accurately determined based on the results of the magnetoresistivity measurements. The various spin configurations in the phase diagram are identified and the parameters of the Hamiltonian determined using the results of the Monte Carlo simulation.

†Work at MIT supported by AFOSR Contract #F49620–83–C–0011.

11:12

MP 12 **Photoconductivity of Graphite Fibers.**† J. STEINBECK, G. BRAUNSTEIN, F. YU, M.S. DRESSELHAUS, MIT, T. VENKATESAN, Bell Comm. Res.—A photoelectric response has been observed in graphite fibers. The existence of a photoelectric response in graphite fibers is surprising since single crystal graphite is a semimetal. The rise and fall times of the photoelectric response have been measured to be on the order of 3ms, suggesting a trapping mechanism for the observed photoelectric effect. Results for the dependence of the photoelectric response on temperature, fiber diameter, and heat treatment temperature are reported for temperatures ranging from 10K to 300K, diameters ranging from 5μm to 50μm and heat treatment temperatures up to 3300K. Our results suggest that the photoelectric response of graphite fibers is due to a trapping mechanism, consistent with the observed decrease in the photoelectric response signal below ~ 170K. The defect trapping mechanism also explains the decrease in photoelectric response as the fiber diameter is increased, and as the heat treatment temperature is increased. The observation of a photoelectric response may provide a new technique for studying defects in graphite. In this regard it is significant that highly oriented pyrolytic graphite (HOPG) shows no photoelectric response. The effect of intercalation on the photoelectric response will be discussed.

†The MIT authors acknowledge support from AFOSR Contract #F49620–85–C0147.

11:24

MP 13

c-axis Resistivity of $FeCl_3$ Intercalated Graphite *

A. Ibrahim, R. Powers, M. Tahar and G.O. Zimmerman, Boston University.

The c-axis resistivity of stage 2, 3, 4, 5 and 9 of $FeCl_3$ intercalated graphite, as well as that of HOPG was measured by means of a four terminal method between room temperature and 1K. The room temperature resitivities are 1.15, 1.08, 0.784, 1.63, 0.701 and 0.098 for stage 2, 3, 4, 5, 9 and HOPG respectively. The temperature coefficient of the resistivity is negative in stages 2, 3 and 4, approximately zero in stage 5, and positive in stage 9 and HOPG. The data are in qualitative agreement with the theory of Sugihara[1].

* Supported by the Air Force Office of Scientific Research Grant AFOSR 82-0286.

1) K. Sugihara, Phys. Rev. 29B, 5872, (1984).

Supplementary Program

MP 14

Spin Lattice Relaxation in Stage-6 $FeCl_3$ Intercalated Graphite Near the 1.75K Magnetic Anomaly.

A. Ibrahim and G.O. Zimmerman, Boston University.

The relaxation time of Fe^{+++} ions in stage-6 intercalated graphite was measured by means of the Casimir & du Pre method[1] in the vacinity of the 1.75K magnetic anomaly[2]. The in and out of phase susceptibility was measured at frequencies of 40, 100, 400, 800, and 1000 Hz. It is found that there is a maximum in the relaxation time near the anomaly and that there the ratio of the specific heats at constant field to that at constant magnetization also has a maximum. The two maxima are displaced in temperature.

* Supported by the Air Force Office of Scientific Research Grant AFOSR 82-0286.

1) Casimir & du Prè, Physica 5 507 (1938).
2) Zimmerman, Nicolini, Solenberger and Gata, p.101 Extended Abstracts, Proceedings of Symposium 1, 1984 Fall Meeting of the Materials Research Society, Eklund, Dresselhaus and Dresselhaus editors. MRS Pittsburgh, 1984.

MP 15 Localized Phonons in Stage Disordered Graphite Intercalation Compounds. P. HAWRYLAK and M. L. WILLIAMS, Brown University.*-- The effect of stage disorder(1,2) on [001]L phonons in intercalated graphite is studied. The energies and localization length of phonons associated with stage 3 and 5 impurity units in stage 4 potassium - graphite are calculated. The phonon density of states is predicted as a function of stage disorder and compared with random distribution of potassium in the graphite host.

* Supported in part by the U. S. Army Research Office, Durham.

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2. M. E. Meisenheimer and H. Zabel, Phys. Rev. Lett. 54, 2521 (1985).

Williams, Ellen D. — EK2, EK10, EK12
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Williams, G.P. — KI15
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